Type 3510-1 and Type 3510-7 Pneumatic Control Valves





Type 3510-7 with 120 cm² actuator and integrated positioner



Type 3510-1 with 60 cm² actuator



Type 3510-1 with 120 cm² actuator

Mounting and Operating Instructions

EB 8091 EN

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Definition of signal words



DANGER!

Hazardous situations which, if not avoided, will result in death or serious injury



WARNING!

Hazardous situations which, if not avoided, could result in death or serious injury



NOTICE

Property damage message or malfunction



Note:

Additional information



Tip:

Recommended action

1 Important safety instructions

- The valve is to be mounted, started up or operated only by trained and experienced personnel familiar with the product.
 - According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.
- Any hazards that could be caused in the valve by the process medium, the operating
 pressure, the signal pressure or by moving parts are to be prevented by taking appropriate precautions.
 - To ensure appropriate use, only use the valve in applications where the operating pressure and temperatures do not exceed the specifications used for sizing the valve at the ordering stage.
- Proper shipping and storage are assumed.



Note:

According to the ignition risk assessment performed in accordance with EN 13463-1, section 5.2, the non-electrical actuators and valves do not have their own potential ignition source even in the rare incident of an operating fault. As a result, they do not fall within the scope of Directive 94/9/EC.

For connection to the equipotential bonding system, observe the requirements specified in section 6.3 of EN 60079-14: 2011 (VDE 0165 Part 1).

2 Design and principle of operation

The pneumatic control valve consists of a Type 3510 Micro-flow Valve (with globe or angle-style body) and a Type 3271-5 Pneumatic Actuator (Type 3510-1 Control Valve) or a Type 3277-5 Pneumatic Actuator (Type 3510-7 Control Valve).

The modular design allows the actuators to be exchanged and an insulating section or metal bellows to be fitted to the standard valve version.

The medium flows through the valve in the direction indicated by the arrow. The posi-

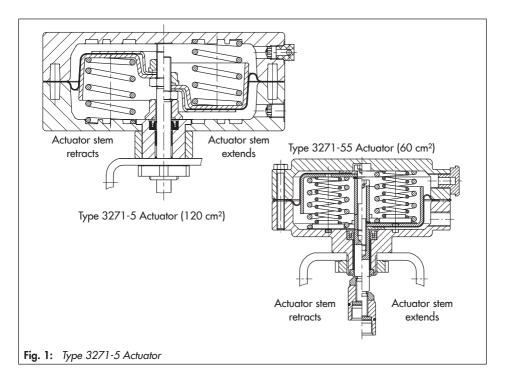
tion of the plug (3) determines the flow through the valve seat (2).

The plug is moved by a change in the signal pressure acting on the diaphragm of the actuator.

The plug stem (6) is connected to the actuator stem (8.1) by the stem connector (7) and is sealed by an adjustable PTFE packing.

Fail-safe action:

Depending on how the compression springs (8.3) are arranged in the actuator, the valve has two different fail-safe positions:

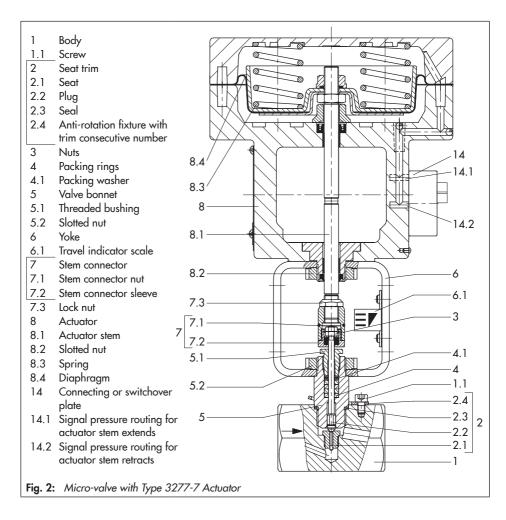


Actuator stem extends:

When the signal pressure is reduced or the air supply fails, the springs move the actuator stem downwards and close the valve. The valve opens when the signal pressure is increased enough to overcome the force exerted by the springs.

Actuator stem retracts:

When the signal pressure is reduced or the air supply fails, the springs move the actuator stem upwards and open the valve. The valve closes when the signal pressure is increased enough to overcome the force exerted by the springs.



Mounting accessories

- Direct attachment: positioners can be mounted directly to the additional yoke of the Type 3277 Actuator.
- Interface according to IEC 60534-6
 (NAMUR): a mounting kit (1400-9031)
 allows the attachment of positioners, limit switches, solenoid valves and other valve accessories. We recommend using an insulating section or bellows seal for flanged valves to provide more space to mount valve accessories.

3 Assembling and adjusting the valve and actuator

The different signal pressure connection of the actuators must be observed on assembly if the valve and actuator have not been assembled by the manufacturer.

3.1 Signal pressure connection

Type 3510-1 Control Valve with Type 3271-5 Actuator

→ Connect the signal pressure line for valves with actuator with "actuator stem extends" fail-safe action to the connection on the bottom diaphragm case, and for valves with actuator with "actuator stem retracts" fail-safe action to the connection on the top diaphragm case.

Type 3510-7 Control Valve

with Type 3277-5 Actuator
If the actuator is operated without a directly attached positioner, a **connecting plate** (accessories) is required. In this case, the signal pressure is routed directly over the signal pressure connection of the connecting plate to the actuator diaphragm chamber.

- → Turn the connecting plate to align the correct symbol for the fail-safe action ("actuator stem extends" or "actuator stem retracts") with the marking.
- Make absolutely sure that the gasket for the connecting plate is correctly inserted.
- The connecting plate has threaded holes with NPT and G threads. Seal the connection that is not used with the rubber seal and square plug.

Actuator with directly attached positioner:

The signal pressure is transmitted to the diaphragm chamber through the holes on the left or right side of the yoke and over a **switchover plate** (accessories). The fail-safe action of the actuator ("actuator stem extends" or "actuator stem retracts") determines how the switchover plate must be aligned with the marking.

Turn the switchover plate to align the correct symbol for the fail-safe action with the marking.

The attachment either on the left or right side of the actuator is determined by the required operating direction of the positioner (>>) or (<>).

Accessories:

Switchover plates and connecting plates are listed as accessories.

Actuators with device index .01 (e.g. 3277-531xxx20.01) (old = .00) are equipped with new connecting plates.

Old and new plates are not interchangeable.

Switchover	New	Order no. 1400-6822	2
plate	Old	Order no. 1400-6819)

Switchover New Order no. 1400-6823 plate

Old G thread Order no. 1400-6820
Old NPT thread Order no. 1400-6821

NOTICE

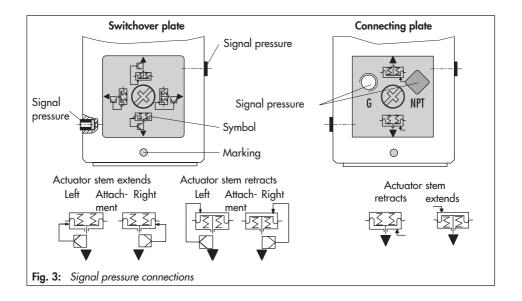
A supply pressure above the maximum permissible limit will damage the actuator.

Do not allow the supply pressure to exceed the maximum permissible limit.

Maximum permissible supply pressure

Fail-safe action "actuator stem retracts":
 see table below

Signal pressure range	Adjusted to	Max. perm. pressure	
0.2 to 1	0.4 to 0.8	2.5	
0.4 to 2.0	0.8 to 1.6	3.3	
1.4 to 2.3	1.7 to 2.1	3.8	
2.1 to 3.3	2.4 to 3.0	4.7	



Fail-safe action "actuator stem extends":
 4 bar

3.2 Assembly and adjustment

For actuators with a switchover plate for attachment of a positioner, a suitable adapter needs to be connected to the hole at the side. Alternatively, the connecting plate (Fig. 3, right) can be used.

- Loosely thread the lock nut (7.3) and stem connector nut (7.1) upward onto the plug stem (Fig. 2).
- Slide slotted nut (8.2) over the stem connector nut and lock nut.
- 3. Place actuator on valve yoke (7) and fasten tight using slotted nut (8.2). For actuators with "actuator stem extends", apply approx. 50 % of the signal pressure range (see nameplate) to the actuator using a pressure regulator to retract actuator stem far enough to screw together the stem connector nut (7.1) and stem connector sleeve (7.2).
- 4. Screw together stem connector sleeve (7.2) and stem connector nut (7.1) as tightly as possible.
- 5. Apply lower signal pressure range value to the signal pressure connection. For a signal pressure range (bench range) for example, 0.4 to 0.8 bar and an actuator with fail-safe action "actuator stem extends", the lower signal pressure range value is 0.4 bar; for "actuator stem retracts" it is 0.8 bar.
- 6. Turn the stem connector (7) on actuator stem until the plug stem moves from the

closed position at the corresponding lower range value.

To do so, change the signal pressure each time at the pressure regulator, and return to the lower range value.

- Fasten the lock nut (7.3) to secure the stem connector in this position.
- 8. Align travel indicator scale (6.1) with the black ring on the stem connector.

4 Installation

4.1 Mounting position

The valve can be mounted in any desired position.

The following points must be observed during installation:

- Install the valve free of stress. If necessary, support the pipelines near the connections.
- Flush the pipeline thoroughly before installing the valve.
- → In valve versions with bellows seal or insulating section installed in pipelines that are to be insulated:
 Do not insulate the bellows seal bonnet or insulating section (9) as well.

Test connection

The version with bellows seal can be fitted with a test connection (with G 1/8 thread) at the bellows seal bonnet to allow the tightness of the bellows to be monitored. We recom-

mend installing a suitable leakage indicator when explosive media or media that are hazardous to health are used.

5 Operation – Reversing the operating direction

If it becomes necessary to reverse the failsafe action of the actuator from "actuator stem extends" to "actuator stem retracts" or vice versa, refer to the mounting and operating instructions of the actuator for details.

- ► EB 8310-1 for Type 3271-5
- ► EB 8310-1 for Type 3277-5

6 Troubleshooting

External leakage can indicate that the packing is defective or the metal bellows is defective (in a version with a bellows seal).

If the valve does not close tightly, tight shutoff may be impaired by dirt stuck between the seat and plug or by damaged facings. We recommend removing the parts, cleaning them, and, if necessary, replacing them with new ones



WARNING!

Risk of injury due to assembly work on a control valve that has not been made safe.

 Depressurize the plant section in which the control valve is installed.

- When media that are hazardous to health are used, drain the pipeline and valve and thoroughly rinse them. Avoid medium residues in the valve's dead spaces. Wear protective clothing.
- When used at high temperatures, allow the plant section to cool down to ambient temperature.
- Shut off and lock supply air and control signals to prevent any hazards due to moving valve parts.
- Remove the valve from the pipeline before performing assembly work.



Note:

The seat and special tools required for installation as well as the necessary tightening torques are listed in the document WA 029. A complete tool kit for the Type 3510 Micro-flow Valve can be ordered separately (order no. 1280-3050).

6.1 Replacing the packing

In case of leakage at the packing, the packing must be renewed as follows:

 Place a wrench (width across flats 17) on stem connector nut (7.1) and unscrew stem connector sleeve (7.2) with a second wrench (width across flats 17).
 For actuators with "actuator stem extends", apply approx. 50 % of the signal pressure range (see nameplate) to the actuator to retract the actuator stem.

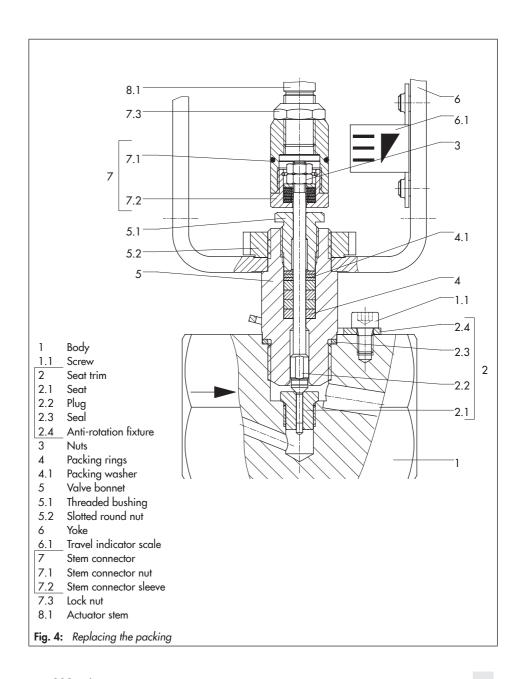
Troubleshooting

- 2. Unscrew the bottom slotted nut (5.2). Remove actuator (8) including yoke (6) from the valve, turning the slotted nut (5.2) so that a groove points towards the travel indicator scale (6.1).
- Remove the nuts (3). Take the stem connector sleeve (7.2) off the plug stem.
- Remove the screw (1.1), lift off the anti-rotation fixture (2.4) and unscrew the valve bonnet (5) from the valve body.
- 5. Unscrew the threaded bushing (5.1). Pull the plug stem along with the plug (2.2) out of the valve bonnet (5).
 - For versions with bellows seal or insulating section: separate the valve bonnet from the bellows seal bonnet or insulating section (9). The plug stem extension (10.1, Fig. 5) remains fixed in the intermediate piece.
- Remove packing washers (4.1) and packing rings (4) from the packing chamber using a suitable tool. Make sure the sealing faces do not get damaged. Clean the packing chamber thoroughly.

Assembly:

- 7. Insert new packing rings. Start with a white ring, followed by two black rings and another white one. Make sure that the butt joints of successive rings are not positioned on top of each other.
- 8. Insert packing washer(s) (4.1). Tighten threaded bushing (5.1) manually.
- Slide plug stem with plug (2.2) into the valve bonnet as far as it will go. Tighten threaded bushing (5.1).

- Make sure that a minimum gap of 1.3 mm between valve bonnet and threaded bushing is observed. If this is not the case, add the required number of packing washers (4.1) (min. 1, max. 3 washers).
- Insert new seal (2.3) into the body.
 Screw the valve bonnet into the body.
- 11. Place the anti-rotation fixture (2.4) on the valve bonnet, ensuring that the screw (1.1) is inserted into the long hole. Fasten tight.
- 12. Slide the stem connector sleeve (7.2) onto the plug stem with the thread facing upward. Screw on nuts (3). Lock nuts against each other, so that approx. 1 mm of the thread is still visible.
- 13. Place the actuator with yoke onto the valve bonnet and secure it with the slotted nut (5.2). For actuators with "actuator stem extends", apply approx. 50 % of the signal pressure range (see nameplate) to the actuator using a pressure regulator to retract actuator stem far enough to screw together the stem connector nut (7.1) and stem connector sleeve (7.2).
- 14. Screw together stem connector sleeve (7.2) and stem connector nut (7.1) as tightly as possible. Tighten lock nut (7.3).
- 15. Check adjustment as described in section 3.2, items 5 to 8.



6.2 Replacing the seat and plug

Standard version:

→ For assembly and disassembly, proceed as described in section 6.1. Additionally, unscrew the seat (2.1) using a socket wrench.

NOTICE

- Risk of damage to the seat trim due to the incorrect exchange of the seat and plug.
 - On exchanging the seat trim (parts 2.1 to 2.4) with a deviating K_{VS} coefficient, also exchange the anti-rotation fixture. The required anti-rotation fixture is supplied together with the new seat trim. A consecutive number is written on it (as on the seat and plug themselves) to indicate which trim parts belong together as well as the material, K_{VS} coefficient and characteristic.
 - Do not combine seats and plugs belonging to different trims.
 - Observe the assignment of seat thread and K_{VS} coefficient (see table below).

Seat thread table Seat thread M10 x 1 M16 x 1 K_{VS} coefficient 0.0001 to 0.4 0.63 to 1.6 PN max. 400 100

Version with insulating section or bellows seal:

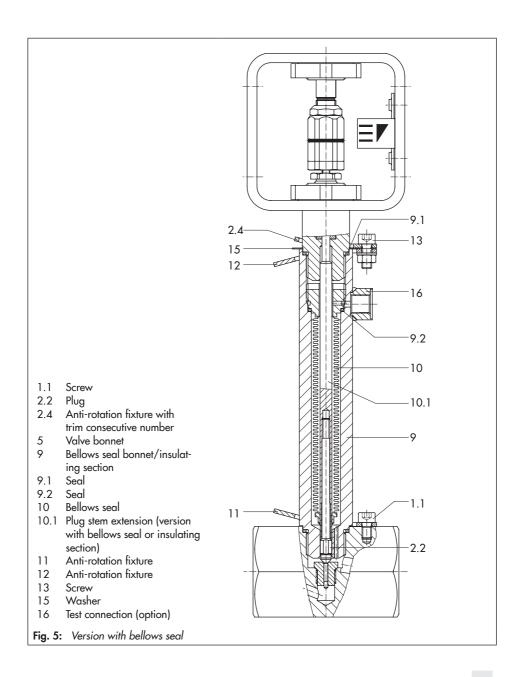
After unscrewing the valve bonnet (5)

- → In versions with insulating section, remove the insulating section (9) from the valve body to allow the plug stem including plug (2.2) to be unscrewed from the plug stem extension (10.1).
- → In versions with bellows seals, unscrew the bellows seal (10) together with plug stem extension (10.1) and plug (2.2) from the bellows seal bonnet (9) using a bellows wrench.

Unscrew the plug stem along with plug out of the plug stem extension and separate the bellows seal bonnet from the valve body.

Before reassembling, renew the seals (9.1 and 9.2). In addition, secure bellows seal bonnet (9) or insulating section (9) as well as the valve bonnet using additional anti-rotation fixtures (11 and 12).

The top anti-rotation fixtures (2.4 and 12) are secured by the washer (15).



7 Customer inquiries

Please submit the following details:

- Order number
- Type designation and configuration ID (Var.-ID)
- Globe or angle valve
- Nominal size and pressure of the valve, K_{VS} coefficient and consecutive number of the installed trim
- Pressure, density, viscosity and temperature of the process medium
- Flow rate in m³/h
- Direction of flow
- Bench range of the mounted actuator (e.g. 0.2 to 1 bar)
- Is a strainer installed?
- Installation drawing

Dimensions and weights

Refer to Data Sheet ▶ T 8091

